

IRONA MELANOSTICTA (ISOPODA: CYMOTHOIDAE)

A new record for New Zealand waters, with descriptions of male, female and larval states.

A. B. STEPHENSON

Auckland Institute and Museum

Abstract. The fish louse *Irona melanosticta* Schiodte & Meinert is recorded for the first time in New Zealand; the male state, female state, and two larval stadia being described from New Zealand specimens. Evidence of the occurrence of protandrous hermaphroditism in the species is discussed.

Specimens of the fish parasite *Irona melanosticta* Sch. & Mein. (Fig. 1) were collected during a population study of the New Zealand garfish *Reporhamphus ihi* Phillipps (Synentognathi: Hemiramphidae) in the Bay of Islands and Hauraki Gulf waters. *Irona melanosticta* has previously been reported from Australia, Japan, Sandwich Islands and South Africa. This is the first record of the genus *Irona* in New Zealand. Powell (1959) listed *Livoneca novaezelandiae* as the parasite of *Hemirhamphus intermedius*

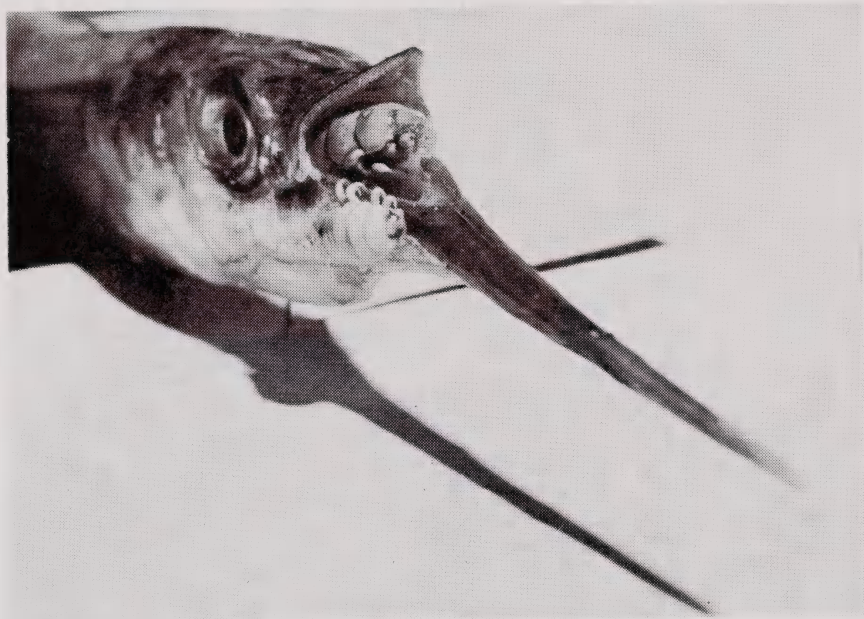


FIG. 1—*Irona melanosticta* on host fish, *Reporhamphus ihi*; female state on buccal pad, male on beak.

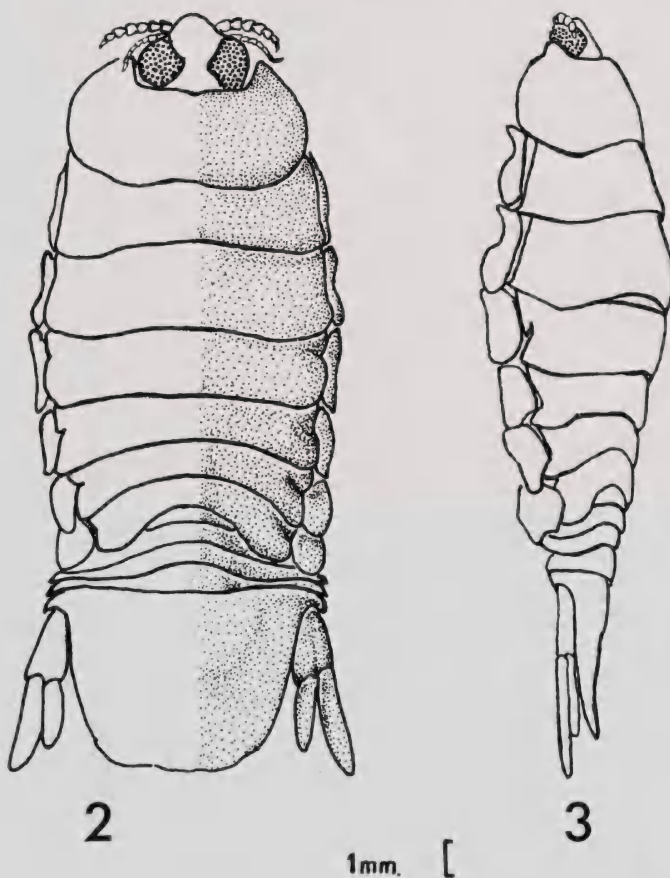
(*Reporhamphus ihi*). However, although this is a closely allied genus, the description of *Livoneca* (Hale, 1940) does not fit any of the specimens collected in this study.

***Irona melanosticta* Schiodte & Meinert**

Irona melanosticta Sch. & Mein. 1884, *Naturh. Tidsskr.* 3, 14: 388, pl. XVII, Figs. 3-5; Thieleman, 1911, *München Abh. Akad. Wiss.* 2, suppl 3: 45, pl. II, Figs. 28, 29; Barnard, 1914, *Ann. S. Afr. Mus.* 10: 373; Hale, 1926, *Trans. Roy. Soc. S.Aust.* 50: 220, Figs. 13, 14.

FEMALE STATE (Figs. 2-3)

Body form subovate, two and a half times longer than greatest width, which occurs over pereaeon segments three and four. Cephalon immersed in first pereaeon segment; width and length almost equal, broad at apex. Eyes large, though relatively smaller in large females. First antenna of eight segments, stouter than second; antennules composed of nine segments. Mouthparts: mandible a small obtusely conical molar process and palp of three segments; first and second palp segments subequal, with a pocket-like depression along segment two; first maxilla almost cylindrical, terminated by a single hooked spine and three bristles; second maxilla much flatter,



FIGS. 2-3—*Irona melanosticta*. 2. Dorsal view of female. 3. Lateral view of female.

with apex of trunk divided as two lobes, larger lobe bearing four hooks and smaller two hooks at apex; maxilliped also of flat laminar segments, terminated by a single lobe bearing five to seven strongly curved hooks. Peraeon convex transversely; first segment (longest of peraeon segments) sublunate, ventral margin sinuate, antero-lateral angles slightly rounded reaching to level of eyes; second segment slightly shorter than both first and third; third segment subequal in length to first; segments four, five, six and seven successively shorter. Coxal plates continued nearly in same plane as their segments; plates of second segment reaching to postero-lateral angles of their peraeon segments, remaining plates extending distinctly beyond posterior angles of their segments; first two pairs of plates with distinct sinuate lower margins and posterior apices rounded; remaining four pairs of plates with only weakly sinuate lower margins, posterior angles narrowly rounded, often just overlapping plate behind. Pleon immersed in peraeon, first segment often completely concealed; first four segments subequal in length, fifth a little longer. Telson semicircular when perfect, the more anterior portion heavily chitinized. Uropod rami flat, subequal in length; exopod extending just beyond telson. Peraeopods successively increasing in length backwards, seventh peraeopod not longer than fifth or sixth. Pleopods foliaceous and broad, with inner and outer rami approximately equal in area, not extending beyond margin of telson when folded back. Natural colour pale grey, with coxal plates and telson often whitish.

Mean length 22.0 mm (164 specimens).

MALE STATE

Body form subovate, more slender than female, two and three-fourths longer than greatest width. Cephalon relatively same size as in female. Greatest width over peraeon segments two and three. First antenna of eight, second of nine segments. Mouthparts as in female, except a full complement of hooks on second maxilla and maxilliped not found in smaller males. First peraeon segment longest, with antero-lateral angles rounded and not greatly produced; remaining segments successively decreasing in length posteriorly. Coxal plates of second and third segments obtuse posteriorly, larger than remaining pairs which are rounded posteriorly. Telsonic segment a little wider than its medial length. Male appendage of second pleopods reaching to level of apex of inner ramus. Rami of both uropods extending distinctly beyond posterior margin of telson; exopod larger and slightly wider than endopod. Natural colour whitish, turning cream in alcohol.

Mean length 7.5 mm (54 specimens).

LARVAL STATE

Mature *Irona* females retain fertilized eggs within a large brood pouch, formed by the growth and overlap of oostegites beneath the peraeon. Of the ensuing larvae found within brood pouches, two stages of development could be recognised: a first stadium developed directly from the ovum and a later second stadium. Within any one brood pouch all larvae are at the same stage of development. While it is possible to arbitrarily separate these two stadia, especially with respect to body size and ornamentation of the appendages, the second stadium is only a continuance of the first stadium and neither larval type differs greatly from the adult form. In both larval stadia the general body form (Fig. 4) is bilaterally symmetrical.

Cephalon relatively large, with apex prominent. Eyes large and conspicuous. Peraeon of six segments, bearing six pairs of peraeopods. Beginnings of seventh peraeon frequently detectable. Pleon of five segments, not immersed in peraeon.

Recognition of first and second stadia is based on the following criteria:

FIRST STADIUM. All appendages apparently encased in a protective sheath, beneath which developing form typical of second stadium can be recognised. Mouthparts: palp of mandible of three segments, first two subequal, third slightly smaller and sculptured with short papillate outgrowths; conical molar process present; remaining mouthparts

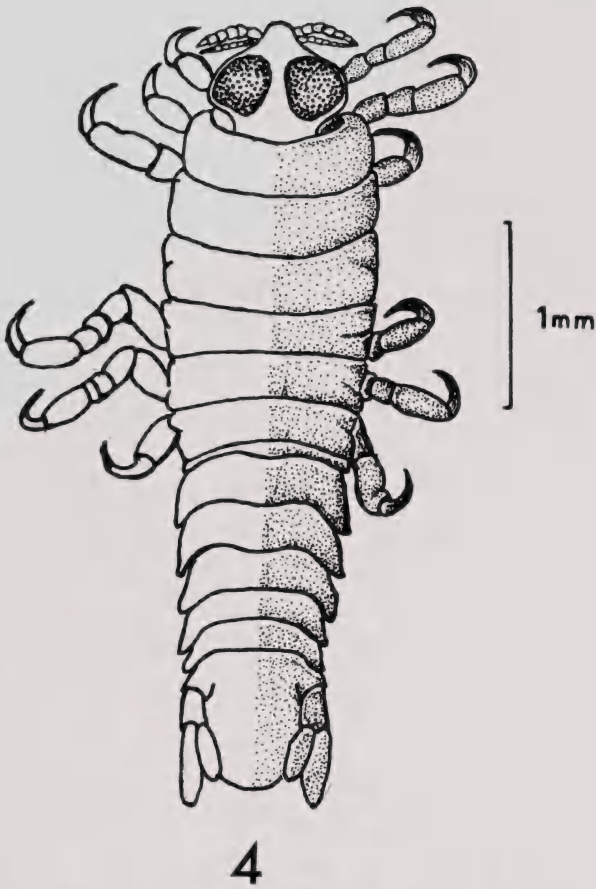


FIG. 4—*Isona melanosticta*. Dorsal view of larval state.

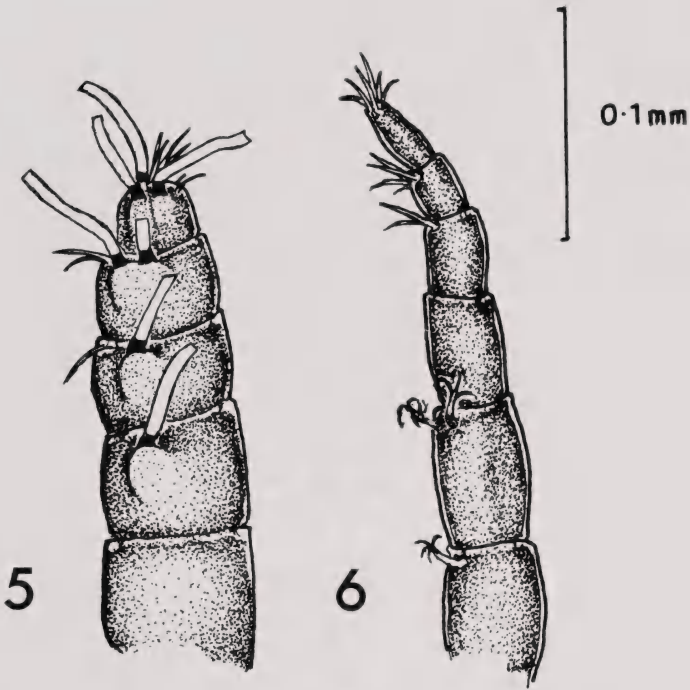
encased in sheath bearing small bumps above developing hooks or spikes. Peraeopods, telson and uropods with scale-like surface sculpture. Slight surface protuberances caused by underlying hair development present along lower edges of most pleopods, telson, and uropods. Terminating claw of peraeopods not strongly curved.

Mean length 2.8 mm (21 specimens).

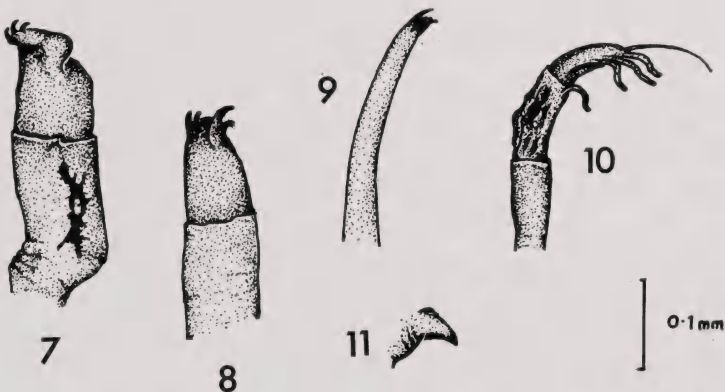
SECOND STADIUM. First antenna of eight segments, with a few single hairs on most segments, but more especially on those nearer apex, and with much longer strap-like outgrowths, three from segment one (terminal cell), two from segment two, one from each of segments three and four (Fig. 5). Second antenna of nine segments (Fig. 6), with a cluster of approximately eight simple hairs at its apex, one or two such hairs on segments two and three below, and short dendritic processes occasionally present on lower segments. Mouthparts (Figs. 7-11) generally resembling adult form; palp of mandible with a longish hair and a series of finger-like projections from its apical cell; second segment with a deeply sculptured surface; apex of second maxilla bearing only four hooks, two from each lobe; terminal lobe of maxilliped with three strongly curved hooks. Anterior peraeopods (Fig. 12) from segments one, two and three with serrated inner edges to claw; peraeopod six (Fig. 13) with three or four rounded spikes on inner border of segment basal to claw; other peraeopods plain. Pleopods (Figs. 14,

15), except endites of third, fourth and fifth, with long plumose hairs along their lower borders; endites of third, fourth and fifth of warty texture, with minute hairs along their inner borders. Telson and uropods (Fig. 16) bordered with natatory hairs; exopod with a single terminating hook at its outer edge.

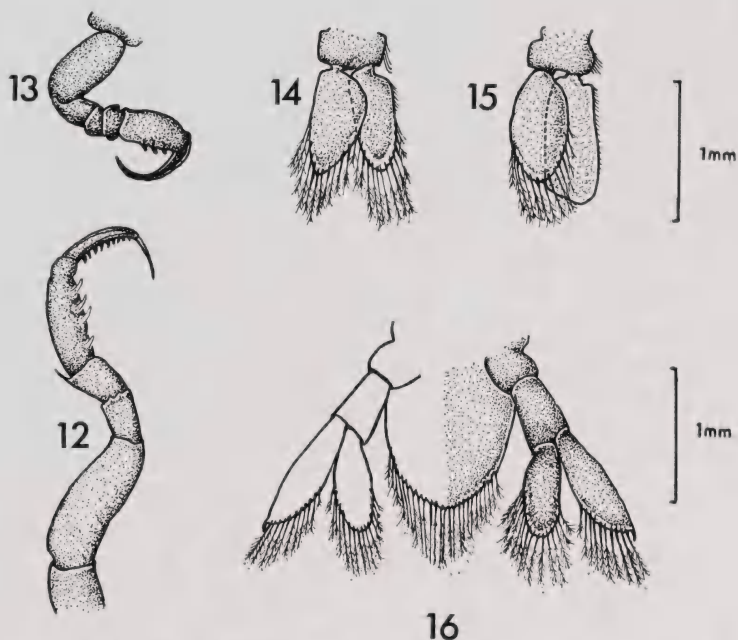
Mean length 3.7 mm (35 specimens).



FIGS. 5-6—*Irona melanosticta*. Secondary larval phase, details of ornamentation. 5. First antenna. 6. Second antenna.



FIGS. 7-11—*Irona melanosticta*. Mouthparts of secondary larval phase (right side). 7. Maxilliped. 8. Second maxilla. 9. First maxilla. 10. Mandibular palp. 11. Molar process.



FIGS. 12-16—*Irona melanosticta*. Appendages of secondary larval phase (right side). 12. First pereopod. 13. Sixth pereopod. 14. First pleopod. 15. Fifth pleopod. 16. Telson and uropods.

DISCUSSION

Although the three states of *Irona melanosticta* can be recognised as separate entities there is, nevertheless, a degree of morphological similarity which prompted a further study of larva to male and male to female relationships. Hale (1929) has already recorded protandrous hermaphroditism in the family Cymothoidae.

The appendix masculina is functional only in males. Nevertheless, it is found, in various stages of emergence from pleopods, in specimens having the general characteristics of second stadium larvae (Figs. 17, 18), and in various states of degeneration in immature females (Figs. 19, 20). The appendix is considered to be fully developed when it reaches the level of, or extends just beyond, the apex of the inner ramus. Evidence shows that the appendix is long in young males, but does not increase in relative size as they grow.

Males are easily distinguished from the second stadium larvae (Table 1) by the loss of hairs from pleopods, telson and uropods, the degeneration of spines from the respective pereopods, and the development of the appendix masculina from the endite of the second pleopod.

The change from male to female (Table 2) appears to be morphologically less radical and frequently is only detectable by the degeneration or loss of the appendix masculina. Body shape and colour serve as other guides. It was found, however, that some large males and/or appendix-



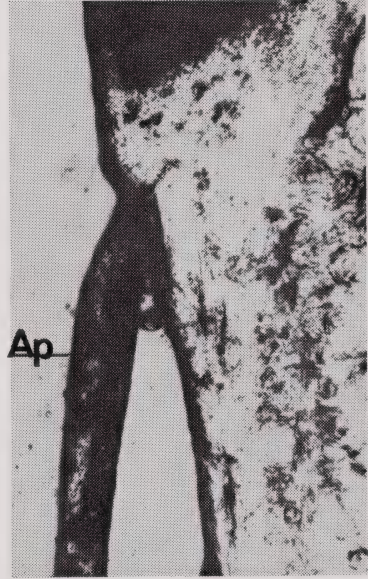
17



18



19



20

0.5mm

FIGS. 17-20—*Irona melanosticta*. Development of appendix masculina. 17. Initial separation of appendix from endite. 18. Appendix almost fully developed.

Degeneration of appendix masculina. 19. Appendix becoming thinner. 20. Appendix tapered at base—the abscission point.
(Ap = appendix masculina.)

bearing females were located in the buccal cavity of the host. It may be inferred that this positional change, from the gill arches to the buccal cavity, is in preparation for their new role as functional females.

These observations, in fact, suggest that protandrous hermaphroditism occurs in *Irona melanosticta*.

ACKNOWLEDGEMENTS. I am grateful to Miss J. E. Robb, University of Auckland, my supervisor, for her assistance and friendly advice. Thanks are also due to Dr. D. E. Hurley, Oceanographic Institute, Wellington, and to Mr. J. Moreland, Dominion Museum, Wellington, for advice; to Mr. G. Batt, University of Auckland, for assistance in photography, and to Mr. and Mrs. G. W. Frater for their kind hospitality at Opunga Cove, Bay of Islands.

REFERENCES

- HALE, H.
1929. *The Crustaceans of South Australia, Part II*. Government Printer, Adelaide. pp. 255-268.
1940. Australian Isopoda Part II. *Trans. Roy. Soc. S. Aust.* 64(2): 220.
- POWELL, A.W.B.
1959. *Native animals of New Zealand*. Auck. Mus. Handbook Zool. 96 pp.

TABLE 1
EVIDENCE OF TRANSFORMATION FROM LARVA TO MALE

Body length (mm)	Appendage hairs	Appendix masculina	Mouthparts
4.0	present	absent	as for 2nd stadium larva
4.1	"	"	"
4.2	"	"	outgrowths of antenna and mandibular palp are shorter & thinner
4.5	"	"	"
4.5	absent	just appearing	"
4.5	"	half length of endite	"
4.6	"	at outer level of endite	"
4.7	"	"	"
4.9	"	extends beyond level of apex of endite	i. outgrowths of antenna just persist on terminal segments
5.0	"	"	ii. palp of mandible has no outgrowths iii. maxilliped has six terminal hooks (three darkly sclerotized, three translucent).

TABLE 2
EVIDENCE OF TRANSFORMATION FROM MALE TO FEMALE

Body length (mm)	
16.0	appendix masculina persists—thin, especially at base
17.8	appendix persists—thin
18.2	appendix persists—very thin, tapered at base which suggests this is an abscission point
18.3	appendix persists—very thin, tapered at base
20.9	appendix persists—very thin, breaking away at base
17.3	no appendix—immature female
19.5	no appendix—immature female
19.8	no appendix—oostegites just apparent
21.2	no appendix—oostegites formed